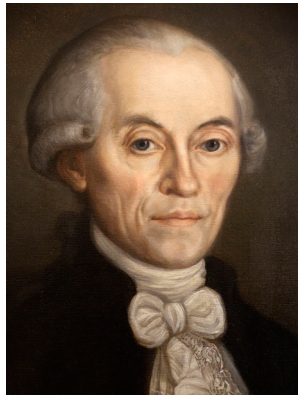
THE ROYAL PHYSIOGRAPHIC SOCIETY OF LUND

ACADEMY FOR THE NATURAL SCIENCES, MEDICINE AND TECHNOLOGY

THE ROYAL PHYSIOGRAPHIC SOCIETY OF LUND
FOUNDED ON DECEMBER 2nd 1772

Anders Jahan Retzius

Nils Hesslén



Andreas Barfoth

HISTORY

The primus motor and one of the founders of this learned society was Anders Jahan Retzius, Professor of Natural History at Lund University, together with Nils Hesslén, theologian, later to become Bishop and Vice Chancellor of the University, and Dr. Andreas Barfoth, M.D. On May 6th 1778 the Society was sanctioned by Royal Command by King Gustav III, and has since then had the epithet "Royal".

A model for the Royal Physiographic Society of Lund was the Royal Swedish Academy of Sciences in Stockholm, which had earlier been founded in 1739, and which had similar objectives. The Swedish Academy was established somewhat later, in 1786.

According to the original statutes, the Royal Physiographic Society was to have "two such interesting and useful aims as Natural History and Economics".

Even though this initial charter of 1772 was retained, over the years additions and amendments were made. The objectives of the Society were initially focussed on practical commercial enterprises, in accordance with the ideals of the Age of Enlightenment. As early as the first decades of the 19th century, however, the activities that occupied the Society tended to shift towards more fundamental scientific fields.

Picture from Lund 1782. Plate by J.F. Martin after an oil painting by Elias Martin. Source: The Medical Historical Society of Southern Sweden

A thorough modernisation of the charter was sanctioned by King Carl XV on November 28th 1862. During the 1950´s and later, certain alterations and amendments were made to this version. After elaborate preparatory work, new statutes were established by the government on May 22nd 1997. His Majesty the King of Sweden is the Patron of the Society.

In 1773 the Society had 20 Swedish members, and that year the first foreign member, Peter Christian Abildgaard, Professor at the University of Copenhagen and founder of the Danish Veterinary Institute, was elected to the Society. A distinction between Swedish and foreign members, however, was not made until 1815.

The aim of the Society is, and has been from its establishment, to provide researchers and scholars from different disciplines the opportunity to meet and hear presentations of new research results and to exchange thoughts and ideas. The Society also provides support to research within its areas of interest.

The history of the Society has been treated by Otto Gertz in "The Royal Physiographic Society in Lund, 1772-1940" (Publ.: C.W.K.Gleerup, Lund, 1940) and Håkan Westling in "The Royal Physiographic Society in Lund, 1772-2006" (Publ.:Wallin & Dalholm, Lund 2006)

The Social Life of the Society

During the 18th and 19th centuries, and also into the 20th century, the Society´s meetings were held in members´ homes, providing an environment in which scientific business could be combined with social contacts. The number of members is nowadays prohibitive for such an arrangement, and the social activities consist of suppers taken after the monthly public lectures and plenary meetings, the annual excursion with spouses in September, and the annual dinner and ball on December 2nd to commemorate the date of the founding of the Society. This is a formal and festive occasion, with the Permanent Secretary's yearly report, the outgoing President's formal address, as well as the awarding of prizes and medals. The dress code is formal, and for male Fellows this requires a black vest and a black bow tie, traditionally considered to be the working dress at meetings of Fellows of the Society from the Society's inception. In parallel to the Society's meetings, the wives of male Fellows often meet informally according to Section at someone's home, the so-called "Ladies Fysiografen".

Physiographic Society - what does the name mean?

The Nordiska Familjebok (The Nordic Family Encyclopaedia), (second edition, Vol. 9, 1908), gives the derivation: Physiography (from the Greek, fýsis, nature, and graphein, to write), the description of nature. - Physiographer, one who describes the landscape. - Physiographic, describing nature. The word has fallen from general use, but the above definition fits the Physiographic Society precisely, being an academy for the Natural Sciences, Technology and Medicine.

THE ROYAL PHYSIOGRAPHIC SOCIETY TODAY

The Royal Physiographic Society has had its administrative secretariat in central Lund since 1991, with offices for the office staff and its elected members. It is also here that the Society´s documents and archives are kept. There are also meeting rooms for the Society´s Board, panels and committees.

Due to the fact that the word "Physiography" is no longer in use, the Society some years ago adopted a sub-title, namely, "Academy for the Natural Sciences, Medicine and Technology". The objective of the Society is to encourage and support research within these fields.

The Society is the trustee of several large donations, from which the investment returns are used to finance research grants. As a result, the Society plays an ever increasing role in the research community. The vast majority of grants are awarded to researchers at Lund University, and of these priority is given to PhD students and younger unestablished researchers.

The Society also administers donations created to provide funds for prizes and medals. In these cases it is a question of rewarding outstanding and prestigious research, and, for obvious reasons, it is usually the work of well-established scholars that is considered.

Today, the Society recognises the urgent need to spread information about outstanding research beyond the walls of the university by reaching out to the general public, thereby showcasing the importance of basic research for our medical and technological wellbeing. This is realised via public lectures at the Society's meetings and via symposia that are open to the general public.

The Society also considers it important to stimulate discussions on current public science policy within the research community, and this it does via yearly symposia. The proceedings of these symposia are recorded for posterity in book form and are also filmed (and can be viewed afterwards on the Society's home page).

The Society publishes an annual report, comprising a list of all its members and officials, an excerpt from the Society´s financial report, obituaries over deceased members, and reports of the meetings and lectures given during the year. Furthermore, several volumes treating specialised subjects have been published and can be found on the Society's home page under Publications.

The Royal Physiographic Society meets *in plenum* once a month during the academic term. At these meetings questions concerning the business of the Society are discussed and decided upon, such as the election of new Fellows, the distribution of grants and the awarding of prizes and medals. These meetings begin with a public lecture.

The Society is independent of the university, both in its administration and economically.

THE SOCIETY'S ORGANISATION

As is the case in other learned societies, candidates are proposed for membership. The elected Fellows of the Royal Physiographic Society are assigned to sections, which are sub-divided into classes. Each class has a prescribed number of Fellows below the age of 65 years. When a Fellow reaches 65 years of age, a new Fellow can be elected to take their place. Older Fellows however remain in their class, and membership of the Society is for life.

Even if the majority of the Swedish Fellows are affiliated with the academic institutions of Skåne, many Fellows are attached to the country's other Universities and Colleges, while others come from the world of industry, commerce and the public service sector. A special group are the Foreign Fellows who, just as for Swedish Fellows, are assigned to sections and classes. The Society also elects Honorary Fellows of whom there are five at the present time.

The Society is administered by a Board consisting of the Preses (President), two Vice Preses (the two outgoing Preses from the previous two years), the incoming Preses, the Permanent Secretary/Treasurer and three other members. The Permanent Secretary/Treasurer is elected for a period of five years. The Preses is elected for one year at a time, but is a member of the Board for the year prior to his/her term as the incoming Preses, and the two years after his/her term as the outgoing Preses. The other Board members are elected for two plus two years.

A special panel appointed for each donation administers the incoming applications and proposes recipients of the grants. Members are elected for three years and can be re-elected once. There are also panels for the selection of candidates for the Society's prizes and medals. A central role is played by the Economic Advisory Council, whose task it is to advise the Society in the administration of its assets. The Economic Advisory Council meets five times per year, and consists of the Permanent Secretary/Treasurer, the Society's economist and members that have competence and experience from the bank, finance and business sectors. Members of the Society's Board often attend the meetings of the Economic Advisory Council.

As in other learned societies, the President has the title Preses (from the Latin praesidio, to sit in front of). The chain borne by the Preses is of silver with a gold-plated seal, made by the goldsmith S. Albrechtsson of Lund, and is a gift presented by the Crafoord Foundation in 1989. It is borne by the Preses on formal occasions.

THE SOCIETY'S ECONOMIC STATUS

The Society receives no public funding. Its economic status is based on about 50 donations that have been received at various times during the Society's history, some as bequests, some during the life of the donor. Each donation has its particular directives, normally specified by the donor, and which may be quite general, for instance, for research in the field of Natural Science at Lund University. In other cases a certain research field is specified for support.

The administration of the Society´s assets has as its aim a long-term and uniform growth. At the same time a high and even financial return is desirable. The economic administration of the total portfolio is handled at the Society´s offices. The Society´s Economic Advisory Council plays a vital role in deciding the long-term economic strategy. At the meetings of this Council major changes to the portfolio are discussed and changes to the Society's securities portfolio are proposed. The final decisions concerning these proposals are taken by the Society's Board. The value of the Society's donations and endowments have risen steadily over the years. The major proportion of the Society's assets have been invested in shares in well-reputed Swedish businesses. Other investments are shares in overseas businesses, equity funds and bonds. Since 2015 the market value of the Society's assets has exceeded 1 billion SEK. During recent years the annual financial investment return – used almost entirely for research grants and scientific prizes – has amounted to approximately 30 million SEK.

Awarded applications
A large number of applications are awarded every year – of 810 applications submitted during 2016, 424 were awarded.

"Deed of donations to the Royal Physiographic Society in conjunction with the 250th anniversary of Lund University"

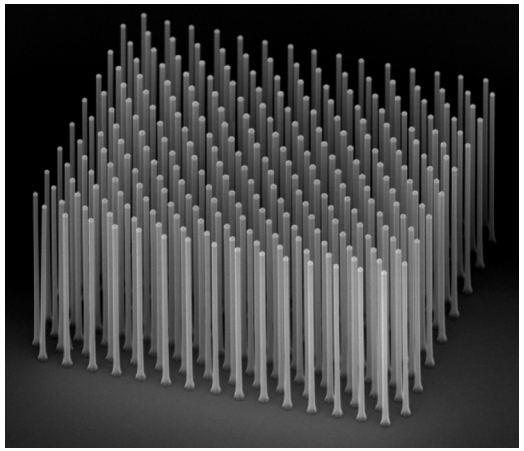
NANO SCIENCE - FUNDAMENTAL RESEARCH WITH GREAT POTENTIAL FOR APPLICATIONS

Professor Lars Samuelson, Solid State Physics and Nano Lund, Lund University. Member of the Royal Physiographic Society in Lund, KVA, the Royal Swedish Academy of Sciences (Physics class) and of IVA, the Royal Swedish Academy of Engineering Sciences.

Research on Nanoscience and Nanotechnology started in Lund more than 25 years ago when a new interdisciplinary research team was initiated: the Nanometer Structure Consortium, or nmC, a center that from 2015 was renamed as NanoLund. One nanometer (nm) corresponds to 10^{-9} m or one billionth of a meter. One usually says that nanoscience is concerned with understanding, creating and applying phenomena on the scale 1-100 nm. This is a size range where much of the material's properties change radically and where you can, right down to the atomic level, design the functionality of materials and devices. This is something very different from studies of small and large molecules, as one has long done in chemistry. Instead, it is about, based on an understanding of the basic physics, the ability to optimize the phenomena that determine the material properties at the macro scale. For example, optical, electrical and magnetic properties are, in principle, all macroscopic manifestations of quantum physics phenomena at the very small scale. In most cases one wants, with the approach of Nanotechnology, to be able to build or construct such functional materials and devices.

Materials Research: Different forms of crystal growth constitute the basis of nearly all our research and enables well controlled creation of crystals with control right down to the atomic level. Already in 1980, when I had just returned to Lund from my postdoc at the IBM Research Laboratory in California, we started northern Europe's first laboratory for MOCVD (Metal-Organic Chemical Vapor Deposition), a technology that enables accurately controlled manufacturing of semiconductors atomic layer by atomic layer. The family of semiconductor materials called III-V semiconductors, for example GaAs, InP and GaN, is the base for optoelectronics as well as high-speed electronics. By "blending" atoms of these materials it is, for instance, possible to obtain emission of various colors, from infrared light through visible light, and all the way out in the ultraviolet spectral range. Materials research, being so key to us, takes place in an exciting borderland between physics and chemistry, where e.g. atomically resolved microscopy provides unique opportunities and deeper understanding.

Quantum dots: Much later, starting around 1994, we belonged to the pioneers in the research on so-called quantum dots, consisting of ultra-small volumes of a semiconductor with a smaller band gap surrounded by another material with larger band gap. By making the enclosed volume very small, typically <10 nm in diameter, the energy structure of the quantum dot can be created such that it resembles the discrete energy levels in an atom, which has given the quantum dots the nickname *artificial atoms*. These nanostructures have enabled the study of different optical quantum phenomena and are also widely used in biomedical research where they operate as fluorophores ideal for optical marking of cells and biomolecules. Quantum dots are today also used as ultra-bright RGB (Red, Green and Blue) light sources in flat panel TVs.



This image was produced by Gustav Nylund

Fig. 1 An array of standing nanowires of InP grown by the MOCVD technique, with the perfectly ordered structure defined by Electron beam lithography. Wire diameter about 60-80nm and the length of wire about 1,5-2µm. A similar technique was used in a highly cited Science article, in which we reported a solar cell record with about 14% efficiency despite nanowires covered only 12% of the surface.

Nanowires: Our probably most important contributions to nanoscience were initiated in the mid-1990s, while I was Visiting Professor at the Riken Institute in Japan, at a time when I developed close contacts with a leading researcher at Hitachi Central Research, Dr. Kenji Hiruma. He had already shown that it is possible to control crystal growth not only as thin films but with a lateral control such that the crystal grows in only one direction, an achievement that formed the basis of what is now an internationally extensive research effort on nanowires. These are not tubular structures like the carbon nanotubes, but are rod shaped, crystalline semiconductors. After some promising experiments in Lund we decided to make a concentrated effort in this field, which proved to be a very good decision. After a few years of pure basic research on the understanding of growth of nanowires and studies of their physical properties we established a versatile research effort on nanowires, ranging from basic nanophysics via various applications, all the way over to biomedicine:

• We focused on the study of quantum physics dominated one-dimensional electron transport, popularly described as the realization of a one-dimensional steeplechase for electrons.

• Early on, we initiated a major EU-financed Integrated Project jointly with European electronics industry and research institutes, where we developed nanowire-based electronics. This technology is now, more than 10 years later, expected to become of great importance now that the size of the transistors, within a few years, will approach 5 nm in size.

• We also developed new solar cell concepts where extremely small nanowires act like nano-photonic antennas that absorb sunlight and converts it to electrical power. This research is also operated as a large EU project which we are the leaders of.

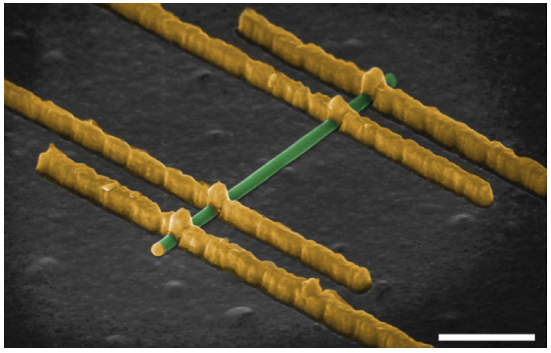
• In other cases, we have realized the world's smallest LEDs, where a single nanowire works as a nanoscopic light source, and where up to a hundred thousand such nanowires together form a macroscopic LED.

• Special forms of hollow nanowires can in our research operate as nano-syringes, so small that they can penetrate the cell membrane without causing damage, and may thus be used as unique tools for medical studies at the single cell level.

Applications: In addition to the academic research, an extensive Industrial Research and Development effort has been created in the spin-off companies working on the commercialization of nanowire research. This applies especially to QuNano AB, Sol Voltaics AB and Glo AB, and recently Hexagem AB. Out of these Ideon companies, Glo AB has made the most progress towards commercializing nanowire-based LEDs for display applications. Sol Voltaics AB develops 3rd generation solar cells, where a flexible film of nanowires can be added to a traditional silicon solar cell, wherein the total efficiency can be increased from the current 17-20% up to 26-29%, which is predicted to become a key technology in the future.The basis of this specific industrial development consists of purely academic basic research into how nanowires can grow in a radically new way with an extremely fast crystal growth.method. This is performed in an aerosol phase, a method we have given the name "Aerotaxy", which was first published in Nature a few years ago.

Research on nanometer structures that started more than 25 years ago with 10-15 participating researchers has grown into one of Lund´s most comprehensive and multidisciplinary research environments, with more than 250 active researchers at the engineering, natural science and medical faculties. Since 2010, we constitute one of Sweden's Strategic Research Areas (SFOs).

In the summer of 2015 the Nanometer Structure Consortium changed its name to NanoLund as it became a center within Lund university. The Director of the NanoLund is Prof. Heiner Linke with Lars Samuelson as Vice-Director.



This image was produced by Gustav Nylund

Fig. 2: The green colored nanowire consisting of InAs, grown by the CBE technique, with the wire contacted using Ni/Au contacts (gold-colored), also here with patterning made by electron beam lithography. This constitutes a component for quantum transport physics, typically carried out at very low temperatures, somewhere between 10 mK and 4 K, i.e. very near absolute zero.

FELLOWS

The Fellows are assigned to sections, which in turn are sub-divided into classes. The current number of Fellows (within parenthesis the prescribed number of positions for Swedish members under the age of 67, and the maximum number of places in foreign sections/classes, which are independent of age).

	Swedish members		Foreign members	
Section for Biology and Geological Science				
Biology class	75	(30)	23	(25)
Geoscience class	30	(11)	9	(9)
Section for Mathematics and Physics				
Mathematics class	17	(9)	6	(6)
Physics and Astronomy class	55	(23)	13	(15)
Chemistry class	46	(16)	7	(10)
Section for Medical Science	160	(55)	17	(22)
Section for Humanities	24	(6)		--
Section for Applied Science and Entrepreneurship				
Agriculture class	28	(8)	5	(6)
Technology class	62	(29)	10	(12)
Economic and Entrepreneurship class	14	(6)		--
Total	**511**	**(190)**	**90**	**(105)**

THE GAVEL

The Royal Physiographic Society´s chairman's gavel was made in 1935, and is of ivory. Its head is decorated with the crown of the society´s emblem, complete with its attributes.

BALLOTING

A ballot, (from the French "ballotte", a small ball) was earlier a procedure for the secret election of persons into a closed society. The voters each deposited either a white or a black token into a casket - too many black tokens and the candidate was rejected. However, this procedure is not used today since elections are very well prepared within various planning groups.

MEDALS

The Memorial Medal in Gold – awarded every third year.
(alternates between Biology, Mathematics-Physics-Chemistry and Medicine)
The Memorial Medal in Silver *(for special services supporting the objectives of the Society)*
The Engeström Gold Medal in Applied Natural Science – awarded every third year.
The Rosén Linnaeus Medal in Gold *(Botany)* - awarded every third year.

PRIZES

Bengt Jönsson's Prize *(Botany)* – awarded every fifth year.
The Wilhelm Westrup Award *(the application of natural science in agriculture and industry)*
The Rosén Linnaeus Prize for Botany - awarded every third year.
The Rosén Linnaeus Prize for Zoology - awarded every third year.
Assar Hadding's Prize *(Geology)* - awarded every third year.
Fabian Gyllenberg's Prize *(Chemistry)* - awarded every third year.
Rolf Dahlgren's Prize *(international prize in Botany)* - awarded every third year.
Sven Berggren's Lecture and Prize *(subject not specified)* – awarded every year.
Sten von Friesen's Prize *(Physics)* - awarded every third year.
Sten and Ingrid Ahrland's Prize *(Chemistry, Nordic countries)* - awarded every fifth year.
Eva and Lars Gårding's Prize *(Mathematics, Linguistics)* - awarded every year.

THE HISTORY OF THE SOCIETY'S SEAL

The Society´s seal is embellished with a *laurel wreath*, the symbol of victory and learning, and above it a *crown* which indicates the royal status of the society, albeit the details of the crown are not regal. Here we find symbols of Nature's three kingdoms: the animal kingdom, *(the lion)*, the plant kingdom, *(the tree)* and the minerals *(the mountain)*. They obviously also symbolise the disciplines Zoology, Botany and Geology. The front of the crown has Aesculapius´s *snake and stave*, the symbol of the Medical Sciences, and above all of these shines the *Polar Star*, the bright symbol of learning and genius.

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The Royal Physiographic Society of Lund. Address: Stortorget 6, 222 23 Lund.
Tel. Int. +46 - 46-13 25 28. E-mail: kansli@fysigografen.se Internet: www.fysiografen.se
Permanent secretary and treasurer: Professor Per Alm

The picture shows the minutes of the meeting of December 2nd 1772 at which the Physiographic Society was founded.